

Working Group: Adaptation to Climate Change

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Summary of Recommendations:

1. Do not add additional critical infrastructure and other investments in the North Bayshore existing flood zone and in other adjacent low-lying areas.
2. Work diligently with the South San Francisco Bay Shoreline Study and the South Bay Salt Pond Restoration Project so that the outcome is both effective as flood control while being as environmentally sensitive as possible.
3. Get the residents of Mountain View more involved in water conservation.
4. Expand the use of recycled water.
5. Develop a rapid response plan to extreme heat days.
6. Develop a volunteer out-reach plan that would enlist residents to identify vulnerable neighbors and to be ready to visit them during extreme heat days.

Introduction and Summary:

The Adaptation to Climate Change Working Group was created because climate change will begin to have significant negative impacts on Mountain View and its residents as the present century unfolds. While some of the more severe impacts on the city could be avoided if the global community responds expeditiously to the challenge of climate change, this rapid response is by no mean a certainty. Moreover, some negative impacts appear to be inevitable, even in a “best case” scenario of rapid global response. Therefore, we believe it is prudent to begin planning now to for the effects of a changing climate on the City of Mountain View.

The three negative impacts that we believe will have the most significant effect on Mountain View during this century are 1) rising sea levels and an attendant increased risk and extent of flooding, 2) decreased water supply caused by a shrinking Sierra snow pack, and 3) health issues from an increase in the number of extreme heat days.

Title: Rise in sea level

Working Group: Adaptation to Climate Change

Statement of Issue:

The level of the sea is rising and despite any reduction in emissions that we might make in the near term, the rise is expected to accelerate and will threaten our Bay Shore and areas near some of our creeks with increased risk of flooding.

According to the International Panel on Climate Change (IPCC) Scenarios for Emissions from 2000 to 2100, carbon dioxide levels¹ in the atmosphere will rise markedly if we follow business as usual. But even in the best-case scenario, CO₂ concentrations will continue to rise. This is because emissions are expected to continue to rise as we transition to new sources of energy and the CO₂ already in the atmosphere will last for hundreds of years. The IPCC scenarios show that if we begin to take action on climate change, this will have a real impact on climate. With concerted reduction in Green House Gases (GHG) global temperatures will increase 3.6 degrees (F), a total cessation in emissions of GHGs would yield a 0.9 degree (F) increase while if we continue growing emissions under a “business-as-usual” scenario, the temperature increase would be 6 degrees (F), as shown in Figure 1.

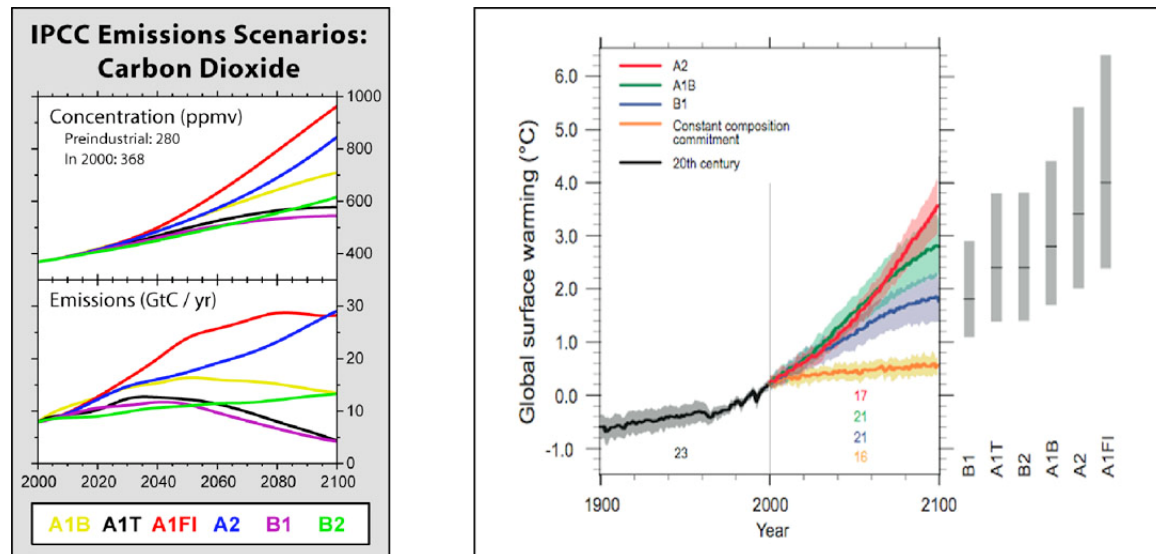


Figure 1. International Panel on Climate Change (IPCC) scenarios for global CO₂ emissions, CO₂ atmospheric concentrations, and surface temperatures.²

As temperatures rise, this will drive an increase in sea level. The IPCC has developed projections for sea level rise during this century under the different emission scenarios. These are shown in Figure 2. Note that the sea level rise projections are much less sensitive to the different emissions scenarios than are global temperatures. This is because the IPCC sea level rise projections are dominated by the thermal expansion of the water in world's oceans. Because the oceans are so vast, and because warming occurs first at the surface but much more slowly in deep waters, the ocean's volume has a relatively slow response time to global temperature changes. This also means that the greenhouse gases we emit today will continue to drive sea level rise for many centuries and millennia in the future as the world's vast ocean waters continue to re-equilibrate to a warmer world.

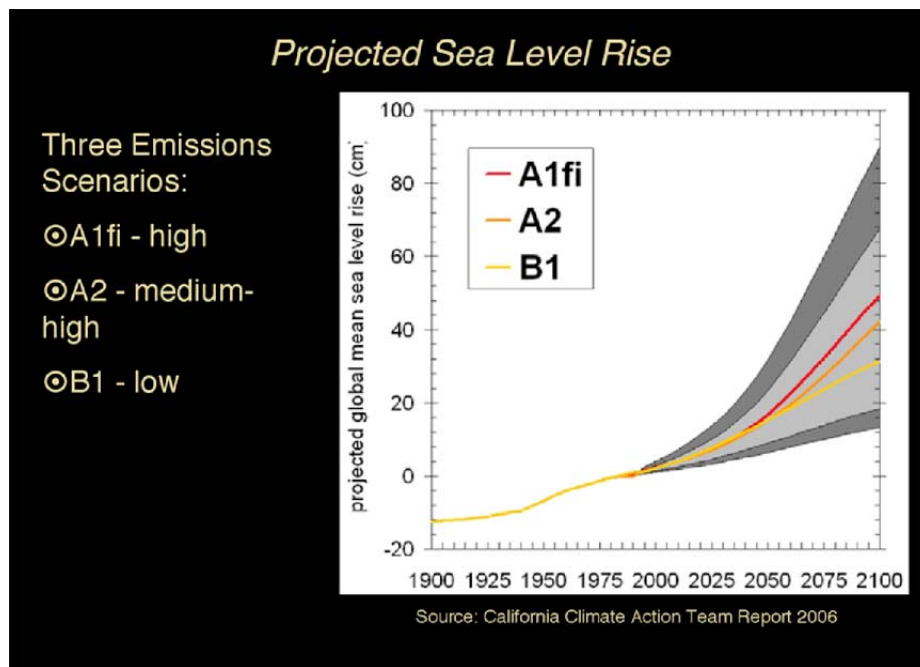


Figure 2. IPCC projections of sea level rise in the 21st century under the different emission scenarios shown in Figure 1.

Looking more carefully at the IPCC projections for 2060, we see a projected range of 10-45 cm with an essentially emission scenario-independent midpoint projection of about 30 cm, or approximately 1 foot of sea level rise.

It is important to note that these IPCC sea level rise projections do not include increased melting of the huge Greenland and Antarctic ice sheets. This is because the IPCC, which is a consensus-based research evaluation panel of experts, holds that dynamics of ice sheet melting are not currently well enough understood to include in their modeling.

Quoting from IPCC 4th Assessment (2007)

“The projections do not include uncertainties in climate-carbon cycle feedbacks nor the full effects of changes in ice sheet flow, therefore the upper values of the ranges are not to be considered upper bounds for sea level rise. They include a contribution from increased Greenland and Antarctic ice flow at the rates observed for 1993-2003, but this could increase or decrease in the future.”³

We believe that it is reasonable to consider the possibility that a warming global climate may well lead to an increase in melting of the vast ice sheets in both Greenland and Antarctica. From a standpoint of assessing risk, it seems even more prudent to consider at least the possibility that melting from these ice sheets may well significantly contribute to sea level rise in this century.

Indeed, there is some recent evidence published in the peer-reviewed journal *Science* that indicates that sea levels are already rising faster than the IPCC projections, as shown in Figure 3. The study’s authors conclude: “Overall, these observational data underscore the concerns about global climate change. Previous projections, as summarized by IPCC, have not exaggerated but may in some respects even have underestimated the change, in particular for sea level.”⁴

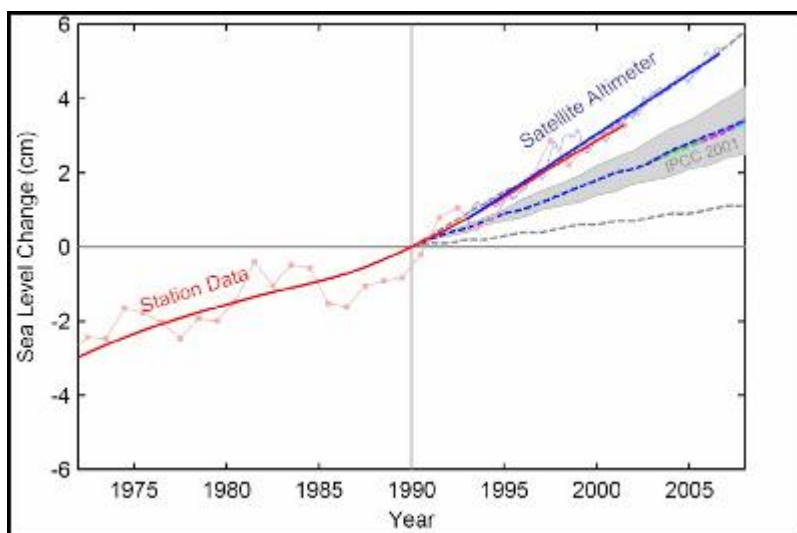


Figure 3. Graph showing IPCC forecast (blue dashes) and observed sea level rise (blue and red solid lines).

In summary, it appears that the IPCC projections, while providing some sort of baseline estimate of anticipated sea level rise in the current century, do not provide a worst-case scenario that a prudent planner may rely on. Furthermore, the farther forward in time you go, the greater the level of uncertainty.

If we use the estimate of a 1-meter sea level rise, which roughly corresponds to the worst-case IPCC scenario for 2100, can get a first look of the impacts on the San Francisco Bay Area. Figure 4 shows simulations done by the San Francisco Bay Conservation and Development Commission (BCDC), which show both San Francisco and Oakland airports going under water with 1 meter of sea rise. As Will Travis of the BCDC stated, “The good news is the Bay is reclaiming much of its historic reach. The bad news is all the expensive stuff we’ve built in its way”.⁵ As can be seen in the leftmost image of Figure 4, which shows the South Bay with 1 meter of water rise, much of Moffett Field and other adjacent low lying areas would be under water.

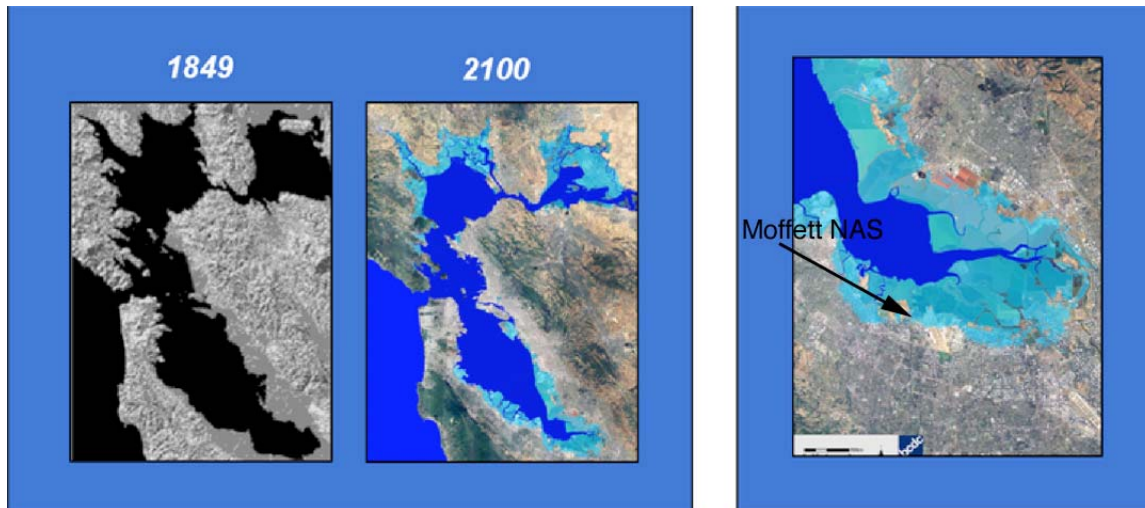


Figure 4. Leftmost image showing the extent of San Francisco Bay and wetlands in 1848. Middle image shows the extent of the Bay today (dark blue) and after 1 meter of sea level rise (light blue). Image on the right shows a more detailed view of the South Bay area showing a 1-meter sea level rise.

A major consequence of sea level rise for the City of Mountain View is an increased risk of flooding. Under current conditions, a significant part of the city is subject to flooding. From the city's website: "Twelve percent of the City of Mountain View is located within special flood hazard areas. Flooding in these areas is caused by tidal flooding from the Bay and flooding from Permanente Creek."⁶ A rising sea level will make the existing risk of flooding significantly worse.

Much of the flooding risk in Mountain View is from Permanente Creek and San Francisco Bay, and the majority of it is on the bay side of Highway 101 or immediately south of 101. Sea level rise will make the risk of flooding worse as the rising floodwaters in the creeks will encounter the higher bay level and begin to back up. Studies in other low lying areas show that a 1-foot sea level rise makes a 100-year flood occur every 10 years. Other studies show the same 100 to 10 year effect can be produced with as little as a 6 inch rise in sea level.⁷ Floods in Illinois are being called a 500-year flood, so even planning for a 100 year flood may not be enough.

Figure 5 shows FEMA maps show the new Google Ames lease area, the proposed new fire station in the Permanente Creek 100 year flood area. Also affected is the land where Costco, REI and other retail outlets are located. There are also adjacent residential areas in the 100-year flood zone.

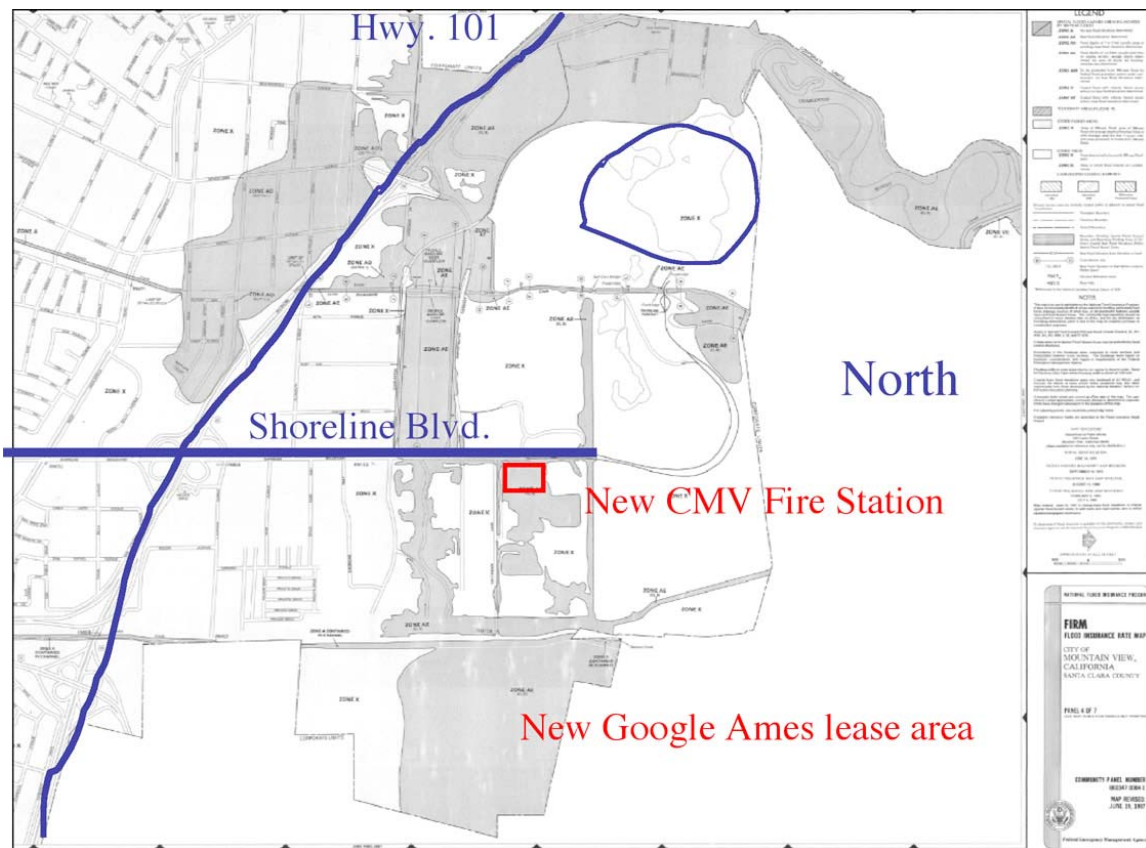


Figure 5. FEMA map showing 100 year flood areas in the North Bayshore area and areas south of US 101. Shoreline Blvd, US 101, Shoreline Lake and the approximate location of the City's new North Bayshore fire station and the Google Ames lease area shown in color for orientation.⁸

Currently two projects are underway that will impact the effects of sea level rise and flooding to Mountain View. The first is the South Bay Salt Ponds Restoration project and the other is the South San Francisco Bay Shoreline Study. The South San Francisco Bay Shoreline Study is being undertaken by the Army Corps of Engineers, the California Coastal conservancy, and the Santa Clara Valley Water District to assess potential flooding in the south bay. A re-map will be released in fall of 2008 showing flooding conditions now and flooding conditions 50 years from now. It is considered likely that levees will be built, although no funding is currently allocated to construct these levees.⁹

In summary, our working group has taken the time to share this information because we are convinced that significant sea level rise will occur and that it poses a serious threat to the city of Mountain View. Taking action will require dollars and commitment from the community to dedicate money to protect against the risk of flooding.

Recommendations:

1. Do not add additional critical infrastructure and other investments in the North Bayshore existing flood zone and in other adjacent low-lying areas where the 100-year flood zone is likely to extend during in this century. Housing seems especially ill advised. Levees do not eliminate the risk of flooding, as New Orleans and the Midwest residents have learned. Use zoning, price structure and education to move development to where it will be least in harms way. This is action which needs to begin as soon as possible and will take many years to complete.
2. Work diligently with the South San Francisco Bay Shoreline Study and the South Bay Salt Pond Restoration Project so that the outcome is both effective as flood control while being as environmentally sensitive as possible. Maintenance of the levees is critical. Encourage public participation in the process. Work on these projects can begin immediately. We estimate this study and implementation will take 3 or more years.

Environmental Impact

The most environmentally positive solution to sea level rise would be to allow the bay shoreline to return to marshland and wetlands, nature's natural flood control. The fewer building structures that exist in the flood area, the more land is available for this natural flood protection and the fewer structures are at risk from levee failure. We would hope that the outcome of the South San Francisco Bay Shoreline Study will promote the restoration of wetlands and riparian, build flood water storage, and build a way to move flood water safely out of the community.

Fiscal Impact

Not allowing businesses to build in the North Bayshore area could result in reduced revenue by lowering economic activity in the flood prone areas. Moving existing city buildings would be a direct cost but could be done on a gradual basis, as structures reach the end of their useful lives. Moving city buildings currently on the flood plain would cost over \$300,000 (very high cost)

By working with the South San Francisco Bay Shoreline Study and the South Bay Salt Pond Restoration Project, the city can share the information gathering and solution planning with other resources and gain from the team effort. Building levees and other flood protection would be very expensive. \$300,000 (very high cost)

A quote from a recent SF Chronicle article, dated June 18, 2008. "The flooding in Iowa has caused \$1.5 billion in damage, but officials say the cost would have been even higher if the federal government had not purchased low-lying land after the 1993 deluge, which caused \$12 billion in damage. Since then the government has bought out homes and turned much of the land into parks and undeveloped area that can be allowed to flood with less risk." Our strong recommendation is to not build in the flood plain of the North Bayshore area and to move existing buildings to safer ground as soon as expedient.

Obstacles:

The first obstacle will be money. Moving city buildings and building levees is expensive. The city would have to alter its budget to address these new expenses.

The second is creating the public will to rezone the North Bayshore to limit or prohibit development. We will lose in the short term by planning for the future, when many of us may not even be here. We, the Task Force and other community groups, will need to educate and engage all members of the Mountain View community to adopt a common vision for the city and to participate in a shared sacrifice.

Partnerships:

Work with the South San Francisco Bay Shoreline Study and the South Bay Salt Pond Restoration Project. Work with local businesses, especially those that reside in the North Bayshore area. Convince them that working with the community of Mountain View to create environmentally sustainable long-range solutions to sea level rise will contribute positively to their corporate image and will, probably, save them money when the North Bayshore area floods, as it surely will one day.

Citations:

¹ The authors acknowledge that carbon dioxide is not the only greenhouse gas that leads to climate change. The discussion here is limited to CO₂ for the sake of simplicity.

² <http://www.ipcc.ch/>

³ <http://www.ipcc.ch/ipccreports/ar4-syr.htm>

⁴ Stefan Rahmstorf, Anny Cazenave, John A. Church, James E. Hansen, Ralph F. Keeling, David E. Parker, Richard C.J. Somerville, Science, 709, 2007.

⁵ Will Travis, Executive Director, Bay Conservation and Development Commission, presented at the Preparing for Sea Level Rise in the Bay Area forum, April 16, 2008, Oakland, California.

⁶ <http://www.ci.mtnview.ca.us/civica/press/display.asp?layout=1&Entry=142>

⁷ Peter Glick, Pacific Institute, presented at “Preparing for Sea Level Rise in the Bay Area” forum, April 16, 2008, Oakland, California.

⁸ Map downloaded from FEMA website,
<http://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&catalogId=10001&langId=-1>

⁹ [http://www.valleywater.org/News_and_events/News_releases/2005%20 news releases/Sept.%2023, 2005.shtm](http://www.valleywater.org/News_and_events/News_releases/2005%20news_releases/Sept.%2023,_2005.shtm)

Title: Diminishing snow pack for drinking water
Working Group: Adaptation to Climate Change

Statement of Issue: The water infrastructure system that we have today will not be adequate in the future.

The Sierra snow pack, the source of virtually all our domestic water supply and the leading supply for the entire state of California, is expected to diminish sharply as the current century progresses. Under a business-as-usual scenario, where greenhouse gas emissions continue to grow with world economy, the Sierra snow pack will be reduced by 80-90% of the current average by the last decades of this century, leaving only 10-20% remaining of what we have now in a typical year. If the world acts quickly and effectively on climate change, current models predict that there will be a 60% reduction in the Sierra snow pack by the end of this century from current averages, leaving 40% of what we currently enjoy. (Source: Dan Cayan, Scripps Institution of Oceanography and USGS, Figure 6)

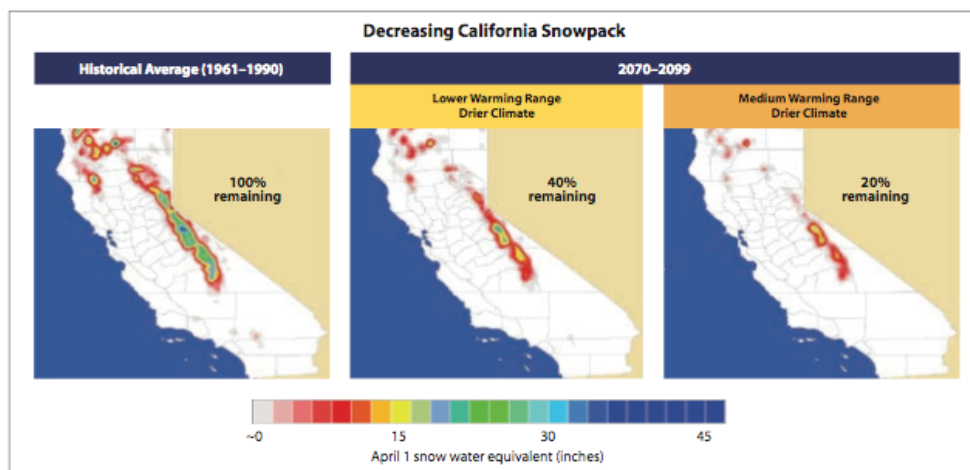


Figure 6. Projected decrease in California's snow pack by the ending decades of the 21st century under two GHG emission scenarios.¹⁰

The combination of sea level rise pushing up into the rivers and lower snow pack sending less fresh water down the rivers, will allow more salt water to go up the rivers. (Will Travis, Executive Director of SF BCDC)

Recommendations:

1. Get the residents of Mountain View more involved in water conservation. This would include a water audit, wise use of water, and native plants that don't require irrigation. Our city water department has a good program now. It needs to be taught to volunteers so that they can go out and teach others. This recommendation can be implemented with little additional funding. It is a long-term activity as education will need to be ongoing to address the arrival of new residents and probable changes that occur in our weather patterns and climate.

2. Expand the use of recycled water. Use recycled water to drink. Wastewater can be purified to be potable, but many people balk at the idea. Residents need to be educated. San Jose currently has over 100 miles of pipe running recycled water to Milpitas, Santa Clara and San Jose. The pipe carries ten percent of their effluent to businesses for irrigation and cooling towers. They are hoping some day to pump tertiary treated water into the aquifer and then reuse it for drinking water. Mountain View needs to be thinking along these lines. At the minimum, we recommend a study that would determine our risk if an earthquake or diminishing snow pack were to disrupt out

drinking water supply. This project would be long term, three years, probably more.

Environmental Impact:

Water conservation can greatly reduce our consumption of water.

Using recycled water will reduce our dependency on Hetch Hetchy water and help us withstand draughts better.

Fiscal Impact:

Water conservation can be achieved, ideally, through education, city staff working with volunteers. This should cost very little and should be implemented as soon as possible. \$10,000 to \$30,000 Low cost.

Using recycled water is a long-term project and will require capital investment to pipe the recycled water to more locations. During normal cycles of draught it can be used for irrigation, freeing up potable water for drinking. If draughts become the norm, then recycled water will need to be used for drinking. Huge cost. Very high cost: over \$300,000

Obstacles:

Educating residents to use less water will involved a lot of education hours. We hope that people can eventually be convinced to be more conservative with their use of water, especially if they feel that everyone else is making the same sacrifice.

Setting up a system of pipes to take effluent and move it to businesses and residences in the city may be cost prohibitive. Also, would residents accept the recycled water – for irrigation, for bathing, for drinking? How safe could we make the water and what would it take to convince people of its safety?

Partnerships:

Partner with other cities that are facing the same problem and work together to share the costs and to find solutions.

Citations:

¹⁰ <http://www.climatechoices.org/ca/site/our-changing-climate.html>

Will Travis, Executive Director, Bay Conservation and Development Commission, presenter at the Preparing for Sea Level Rise in the Bay Area forum, April 16, 2008, Oakland, California

Dan Cayan, Scripps Institution of Oceanography and USGS, presenter at the Preparing for Sea Level Rise in the Bay Area forum, April 16, 2008, Oakland, California

<http://www.sanjoseca.gov/sbwr/about.htm>

TITLE: HEALTH ISSUES

WORKING GROUP: ADAPTATION TO CLIMATE CHANGE

Statement of Issue:

Climate change will bring about more heat waves and air pollution. More heat waves are a special danger to the elderly and the poor because they lack the means to escape the heat. The elderly risk heat stroke, children risk asthma. Climate change will increase food-borne and water-borne infectious diseases such as cholera. Climate change can cause the migration into new areas of vector-borne and zoonotic borne diseases such as Lyme disease, West Nile virus and malaria. (H. Josef Hebert, Associated Press reporter, SF Chronicle, April 10, 2008)

Our working group talked to the Health Education representative at Kaiser and the Executive Director of Patient Care Services at El Camino Hospital and neither site had any plan to address the community problems that would arise with a prolonged heat wave. Both were only prepared to treat patients who presented themselves at the hospital. Many of us remember, "A record heat wave that scorched Europe in August 2003, claiming an estimated 35,000 lives. In the worst heat spell in decades, temperatures in France soared to 104 degrees Fahrenheit (40 degrees Celsius) and remained unusually high for two weeks. <http://www.earth-policy.org/Updates/Update29.htm> It is very possible for that to occur in Mountain View.

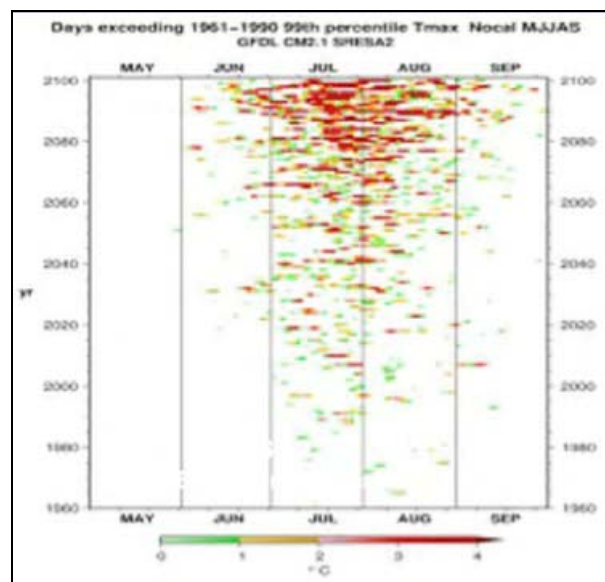


Figure 7. Increasing number of extreme heat days (exceeding the 99th percentile) in Northern California as the 21st century progresses.¹¹

Recommendations:

1. Develop a rapid response plan to public health problems resulting from extreme heat days. The city needs to work with Kaiser, El Camino Hospital and Camino Medical Group to identify the health risks and to work out a plan to mitigate the effects of extreme heat days. Develop a list of facilities where people can go to find shelter from the heat. This might include an overnight stay. It can also include identifying locations that need to stay on the power grid in order to have air conditioning, such as nursing homes. This is a medium term activity to be completed within three years.

2. Develop a volunteer out-reach plan that would enlist residents to identify vulnerable neighbors and to be ready to visit them during extreme heat days. All residents should be educated about what to do during extreme heat days and should have emergency numbers to call if they need help. This is a short term activity, to be completed within a year.

Environmental Impact:

The adoption of these two recommendations will not improve the environment, but it will keep our citizens safer.

Fiscal Impact:

Both recommendations will require staff time, but not large amounts of money. Creating a plan and putting it in place is more cost effective than waiting for the crisis and then reacting to it.

Medium cost: \$30,000 to \$100,000

Obstacles:

The partnering with the health care facilities should not present obstacles. We have already had some extreme heat days. The groups involved should recognize the advantage of working together for an optimum outcome for our residents.

Educating residents should not encounter resistance, but it will require many volunteer hours to identify and reach all the people who need to be educated. Unfortunately, the people who will need the help the most, will be the hardest to find – the low income, the transitory workers, the non-English speaking population.

Partnerships:

This is the perfect place to form a partnership with local health care agencies. Besides the main health care providers, local groups such as Rotacare, CHAC and other should be asked to participate. They will be a good conduit to low income and non-English speaking populations.

¹¹ Dan Cayan, Scripps Institution of Oceanography and USGS, presenter at the Preparing for Sea Level Rise in the Bay Area forum, April 16, 2008, Oakland, California